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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

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INVENTOR(S)		
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Additional inventors are being named on the _____ *separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

MARK SCANNING METHOD

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☑ Specification *Number of Pages* 4 ☐ CD(s), Number _____

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☑ Application Data Sheet. See 37 CFR 1.76

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☑ Applicant claims small entity status. See 37 CFR 1.27.

☑ A check or money order is enclosed to cover the filing fees.

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FILING FEE Amount ($): 80.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☑ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

SIGNATURE _____ Date March 3 2004

TYPED or PRINTED NAME Jeffrey J. Schwartz REGISTRATION NO. 37,532 *(if appropriate)*

TELEPHONE 704/552-1889 Docket Number: 138/9

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This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop Provisional Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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MARK SCANNING METHOD

Technical Field and Background of the Invention

This invention relates to a mark scanning method. The invention offers a novel distinct solution for tracking parts through their manufacturing stages, and in particular for automated tracking.

It is important that many products are traceable back to and through manufacturing. Thus, for example, if a safety-critical defect is detected in a particular item, then products with the same history can be identified and tracked down to minimize damage and liability. As such, it is essential that many products be permanently marked in such a manner that manufacturing records for the product can be retrieved for analysis at an unknown future time. For example, aluminum wheels are a primary structural component of an automobile that require full tracability for safety reasons.

The need for automated rapid identification of general products has led to information encoded as 1-D bar codes for machine reading. These all-pervasive linear barcodes are typically high contrast marks, most often black bars on a white background to facilitate reliable and rapid scanning and decoding. When low contrast barcodes are used they generally are unreliable with conventional scanners. A solution used to overcome the low contrast issue is to use a particular type of 2-D barcode, where the bars are either below or above the general surface. Then, by using more sophisticated scanners based on laser distant measurement units, these codes can reliably read. This type of 2-D barcode is called a "bumpy bar code" by some (www.bumpybarcode.com).

There is a second, more common form of 2-D barcodes used for marking product, although they are not cast or formed in. Unlike bumpy bar code, the code is marked in one flat plane, more or less as conventional linear barcodes are. This type of 2-D area barcode offers the ability to provide very dense information coding, as well as redundant information and error correction if the code is damaged. There are a number of such codes, with 2-D Data Matrix being one of the more common. One disadvantage of such codes is they require more sophisticated scanners, although this is not much of an issue for high contrast codes.

Direct part marking (DPM) is often the lowest cost of marking products, as there are little to no marking expendables, unlike labeling or tagging. It is becoming more common that 2-D Data Matrix like codes are formed by DPM processes. While such laser formed marks are more or less 2-D, interestingly, peened marks are actually 3-D marks. Either way, low contrast is often encountered, and such marks can only be scanned satisfactorily when special contrast enhancing lighting and narrow field of views are practiced.

Object of Invention

Therefore, it is an object of the invention to create a method to scan a 3-D mark made in a part by DPM processes, and one that greatly relaxes the rigid lighting requirements of present machine vision systems.

Description of the Preferred Embodiment and Best Mode

Laser distance measurements systems are commonly used to precisely measure the distance between a point of interest and the sensor. Basically, a

very narrow beam of collimated light is projected onto the point of interest and reflected light hits a linear light detector array where the output signal is proportional to the distance to the object. Such single laser distance measurement sensors can be scanned across a surface to get a 2-D map of a surface. By moving the surface past such a scanner, a 3-D surface map can be obtained. For example, this technology is used in tire inspection to search for out of specification bulging in the tire sidewall.

Laser beams can also be projected as a line and the reflected light gathered in a light detector area array. With this technology it is possible to measure a limited 2-D surface without any raster scanning. Moving the surface relative to such a static line scanner then produces a 3-D surface image. On a multiple order of magnitudes larger scale, aircraft radar does a similar task using a different physical phenomenon.

By taking a laser distance map of a surface that has an area matrix coding peened or otherwise formed into the surface, it is possible for a person to see the surface and coding in difficult lighting conditions. Since the background surface that has the peened DPM code formed into it is dominant, it is a straightforward task to subtract it from the overall surface map to yield the 2-D dot matrix for decoding processing.

Thus, the invention is micro mapping of a surface that contains an area code that is formed into the surface, determining the general background surface and then subtracting it to reveal the coded mark, and then processing it to determine the part identification and any other data encoded.

A mark scanning method is described above. Various details of the invention may be changed without departing from its scope. Furthermore, the foregoing description of the preferred embodiment of the invention and best mode for practicing the invention are provided for the purpose of illustration only and not for the purpose of limitation.

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